



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/806,157	03/23/2004	Tetsuro Nakamura	03500.017976	2170
5514 7590 07/27/2007 FITZPATRICK CELLA HARPER & SCINTO 30 ROCKEFELLER PLAZA NEW YORK, NY 10112			EXAMINER TRINH, THANH TRUC	
			ART UNIT 1753	PAPER NUMBER
			MAIL DATE 07/27/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/806,157	NAKAMURA ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Thanh-Truc Trinh	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 23 March 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☒ Claim(s) 1 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>8/30/2004</u> .   | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Claim Objections*

1. Claim 1 is objected to because of the following informalities:

Line 13, "lease" should be – least --.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-5 are rejected under 35 U.S.C. 102(b) as being anticipated by Shiozaki (US Patent 5977477).

Regarding claim 1, Shiozaki discloses a method of producing a photovoltaic device comprising steps of forming a zinc oxide layer on a substrate at least by electrolytic deposition (See col. 4 lines 39-67); subjecting the zinc oxide layer to rare gas treatment (or ion irradiation) (See Abstract and col. 5 lines 1-12); and forming on the zinc oxide layer a semiconductor layer comprising a-Si, a non-single crystal silicon material, containing hydrogen and having at least one p-i-n junction. (See col. 5 lines 33-50)

Regarding claim 2, Shiozaki discloses the treatment is a rare gas plasma treatment using at least one rare gas selected from the group consisting of He, Ne, Ar. (See col. 5 lines 1-12)

Regarding claim 3, Shiozaki discloses forming a zinc oxide layer by sputtering as described in Example 1. Shiozaki further discloses forming another zinc oxide layer by electroplating as described in Example 4. Therefore, Shiozaki teach forming a zinc oxide layer by sputtering before the forming the zinc oxide layer by electrodeposition.

Regarding claim 4, Shiozaki describes the thickness of zinc oxide layer is 1000 nm (See col. 10 lines 48-49), which is well within the claimed range of 10nm to 5 $\mu$ m.

Regarding claim 5, Shiozaki describes the zinc oxide layer having transmittance of 90% or more (See col. 4 lines 50-51). Therefore, it is inherent that the zinc oxide layer transmitting 50% or more of light with a wavelength of 800 nm.

3. Claim 6 is rejected under 35 U.S.C. 102(b) as being anticipated by Shiozaki (US Patent 5977477) with evidence from Wronski (IEEE Transactions on Electronic Devices, Vol. ED-24, No. 4, April 1977).

Regarding claim 6, Shiozaki discloses a method of producing a photovoltaic device as described in claim 1, wherein the zinc oxide layer is adjacent to an n-type a-Si layer and has a conductivity of less than  $10^{-1} \times 1/\Omega\text{cm}$ , or a resistivity of 10  $\Omega\text{cm}$  or more. (See col. 4 lines 51-52). Note: resistivity = 1/conductivity. Wronski teaches the n-type a-Si layer typically having a resistivity of about  $10^8 \Omega\text{cm}$  at substrate temperature of 300°C (See page 352, 1<sup>st</sup> paragraph of section titled "Discussion" of Wronski). It is the

Art Unit: 1753

Examiner's position that Shiozaki teaches the zinc oxide layer having lower resistivity than that of the n-type semiconductor layer provided adjacent to the zinc oxide layer. Shiozaki teaches the limitation of the instant claim, therefore the reference is deemed to be anticipatory.

In addition, it is also the Examiner's position that a transparent conductive layer (zinc oxide layer) must have lower resistivity than that of a p- or n-type semiconductor layer adjacent to it in order for the transparent conductive layer (zinc oxide layer) to conduct electrons produced from the semiconductor layer, and complete the circuit.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shiozaki (US Patent 5977477) in view of Baik et al. (Thin Solid Film, Volume 345, 8 October 1999, Pages 227-231)

Regarding claim 7, Shiozaki discloses a method of producing a photovoltaic device as described in claim 1.

Shiozaki does not specifically teach providing an adsorption preventive layer between the zinc oxide layer and a p- or n-type semiconductor layer deposited adjacent to the zinc oxide layer.

Baik et al. teach inserting a SiO<sub>2</sub> layer between the zinc oxide layer and the n-type semiconductor layer provided adjacent to the zinc oxide layer. (See page 228, 3<sup>rd</sup> paragraph of section titled "Experimental procedure")

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Shiozaki by providing a SiO<sub>2</sub> layer between the zinc oxide layer and the n-type semiconductor layer disposed adjacent to the zinc oxide layer, because it would increase conversion efficiency. (See page 228, 3<sup>rd</sup> paragraph of section titled "Experimental procedure")

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent 5180434.

Art Unit: 1753

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh-Truc Trinh whose telephone number is 571-272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TT 7/18/2007

*Alex Noguera*  
**ALEX NOGUERA**  
**PRIMARY EXAMINER**  
*July 20, 2007*  
*AU1753*